Amendments to the BACKGROUND OF THE INVENTION:

Please exchange paragraph [0003] with the following replacement paragraph:

[0003] This invention relates to a liquid nanotechnology (micro-emulsion forming) fuel additive composition which reduces the exhaust emissions and improves the fuel economy of internal combustion machines when used at a dose level of 20 to 500ppm in the fuel.

~~[0003] This invention relates to a micro-emulsion fuel additive containing water which improves combustion of hydrocarbon fuels in internal combustion machines.~~

Please replace paragraph [0008] with the following amended paragraph:

[0008] Grangette et al U.S.Patent 4,396,400 discloses that it is possible to produce a low water content fuel emulsion by adding at least 100 ppm of additional water in forming a micro-emulsion fuel with low surfactant content 25 ppm, which gives reasonable emissions reductions when tested in a vehicle on a chassis dynamometer. However, such a mixture is not stable at a surfactant to water ratio of only 0.25:1 and has not been adopted in the real world.

Amendments to the OBJECTS OF THE INVENTION:

Please replace paragraph [0009] with the following amended paragraph:

[0009] It is an object of this invention to provide additional water to liquid hydrocarbon fuels in the form of a micro-emulsion to enhance fuel efficiency.

Amendments to the DESCRIPTION OF PREFERRED EMBODIMENT:

Please exchange paragraph [0012] with the following replacement paragraph:

[0012] Fuel additive compositions are formulated which can be mixed with commercially available liquid hydrocarbon fuels (such as gasoline, diesel fuel, kerosene or jet fuel) to form stable "water-in-oil" type micro-emulsions. Improved combustion and fuel efficiency can be achieved by adding 20 to 500ppm of the additive into the hydrocarbon fuels. Long term stability of this low dose level micro-emulsion fuel is achieved by using high surfactant to water ratios in the additive from about 8:1 to 0.5:1 and more preferably from about 3:1 to 1:1.

~~[0012] Fuel additive compositions are formulated which can be mixed with commercially available liquid hydrocarbon fuels (such as gasoline, diesel fuel or jet fuel) to form stable "water-in-oil" type micro-emulsions. Improved combustion and efficiency can be achieve by adding as little of the composition as needed as to result in 5 to 95 ppm (parts per million) of water in the hydrocarbon fuel. Stability of this low water content micro-emulsion fuel is achieved with use of high surfactant to water ratios in the additive between 8.0:1 and 0.5:1, preferably between 3.0:1 and 1.0:1 and most preferably 2.5:1. The resulting micro-emulsion fuel exhibits improved fuel economy and reduced exhaust emissions~~.

Please exchange paragraph [0013] with the following replacement paragraph:

[0013] The fuel additive composition should comprise in admixture form, from about 10% to 60% (preferably 20% to 50%) by weight of water; from about 30% up to 80% (preferably 40% to 70%) by weight of a surfactant selected from the group consisting of amphoteric, anionic, cationic and non-ionic surfactants (preferably selected from the group consisting of amine alkylbenzene sulphonate, POE [20] sorbitan monooleate, tall oil fatty acids, oleyl imidazoline hydrochloride and oleamide diethanolamine); from 0% to 30% (preferably 10% to 20%) by weight of a co-surfactant selected from the group consisting of alcohols, glycols, and ethers (preferably selected from the group consisting of C1 to C4 alcohols, C2 to C3 glycols and glycol ethers); and from about 0 to about 30% (preferably 0%) by weight of a hydrocarbon solvent (preferably kerosene).

~~[0013] The fuel additive composition should be added to commercially available liquid hydrocarbon fuels at a dose ratio such that all water in such fuel after incorporation comprises from 5 to 95 ppm by weight of the combined hydrocarbon fuel. The additive before adding should comprise from 10% to 60% by weight of water, preferably 20% to 80% by weight; from 0% to 25% by weight of one or more co-surfactants selected from the group consisting of alcohols, glycols, and ethers preferably selected from the group consisting of C_1 to C_4 alcohols, ethylene glycol and glycol ethers; and the balance up to 100% by weight of one or more surfactants selected from the group consisting of amphoteric, anionic, cationic and non-ionic surfactants, preferably selected from the~~

~~group consisting of amine alkylbenzene sulphonate, POE (20) sorbitan monooleate, tall oil fatty acids, oleyl imidazoline hydrochloride and oleamide diethanolamine; and such that the ratio of the surfactant to the water falls within the range from 0.5:1 up to 8.0:1, preferably within the range 1.0:1 to 3.0:1 and most preferably 2.5.1~~.

Please exchange paragraph [0014] with the following replacement paragraph:

[0014] When the fuel additive dose level becomes so low that the background quantity of dissolved water in the fuel starts to become significant, then it is critical to increase the surfactant to water ratio in the additive to compensate for the extra water in the fuel.

~~[0014] The fuel additive compositions including the preferred ones are prepared by mixing the above components sufficiently to form a micro-emulsion additive~~.

Please exchange paragraph [0015] with the following replacement paragraph:

[0015] A fuel composition, intended to be combusted in internal combustion machines, is prepared by mixing the above described fuel additive composition at a dose level from about 20 to 500ppm (preferably 20 to 250ppm) in a liquid hydrocarbon fuel (preferably from the group comprising gasoline, jet fuel, kerosene and diesel fuel).

~~[0015] A suitable liquid fuel composition is prepared by mixing a liquid hydrocarbon fuel mixed with the above described micro-emulsion forming additive so that the composition comprises:from 10 to 400 ppm of one or more surfactants selected from the group consisting of amphoteric, anionic, cationic and non-ionic types; from 0 to 100 ppm of one or more co-surfactants selected from the group consisting of alcohols, glycols, and ethers; and from 5 to 95 ppm of added water with the ratio of surfactant to added water being in the range from 0.5:1 to 8.0:1; and the remaining portion is liquid hydrocarbon fuel. A preferred range for the added water is in the range of 20 to 80 ppm. A preferred ratio of surfactant to added water being in the range of 1.0:1 to 3.0:1. A preference in surfactants is a selection from the group consisting of amine alkylbenzene sulphonate, POE (20) sorbitan monooleate, tall oil fatty acids, oleyl imidazoline hydrochloride and oleamide diethanolamines. Apreference in the selection of the co-surfactants is selected from the group consisting of C_1 to C_4 alcohols, ethylene glycol and glycol ethers. A preference in the liquid hydrocarbon fuel is from the group boiling in the gasoline to diesel fuel range~~.

Please replace paragraph [0016] with the following amended paragraph:

[0016] Internal combustion engines normally show variations in the maximum cylinder pressure and rate of pressure rise from cycle to cycle which is known as cyclic dispersion. This is due to variations in turbulence between cycles which vary flame speeds across the combustion chamber. The inventive micro-emulsion when existing within the body of the fuel tends to reduce these cyclic dispersions. This is turn results in a smoother

running engine with lower emissions, improved fuel economy and reduced engine octane requirements ~~by maintaining cleaner combustion chambers~~.

Please replace paragraph [0018] with the following amended paragraph:

[0018] ~~Thus by achieving even~~ Even an extremely small but beneficial effect at the on-set of combustion has a disproportionally large effect upon the manner in which the combustion subsequently progresses. This mechanism has not been appreciated and utilized by others in the past.

Please replace paragraph [0025] with the following amended paragraph:

[0025] The prior art teaches adding 10,000 ppm of emulsified water together with 5,000 ppm of surfactant which renders the background level of 100 ppm of dissolved water of no ~~significant~~ significance. However, for the present invention, this background level has significance and is not overwhelmed by addition of for example 30 ppm of emulsified water together with 75 ppm of surfactant. Knowledge of the solubility constant for the class of fuel to be treated is an important essential so that the level of background water is considered and factored into the addition. The ratio of surfactant to water is increased as necessary so that subsequent to mixing with the fuel, the ratio of surfactant to water are of within preferred ratios.

Please exchange paragraph [0029] with the following replacement paragraph:

[0029] Because only a small quantity of fuel additive composition is used in the hydrocarbon fuel (20 to 500ppm), it can be used like a conventional fuel additive in already existing and commercially available liquid hydrocarbon fuels. This results in several significant advantages. Even with the high ratio of surfactant to water employed in the additive, the low dose level results in a corresponding low treatment cost. Relative to the fuel savings, this gives a very cost effective product. Also, with less surfactant being used per gallon of fuel (relative to other treatments) there are less emissions from incomplete combustion of surfactants. Even if over time the micro-emulsion breaks down, the amount of released water is not large and can easily be absorbed by the fuel. The expected benefits may be lost but no damage to the engine will occur which could lead to possible product liability claims. The smaller volumes involved with these additives are more readily acceptable to oil refineries and fuel distribution centers because the hardware already exists to incorporate other types of additives on this scale into the base fuels. If the whole fuel had to be emulsified and mixed after the refining process; the complexity and effort would dictate against employment.

~~[0029] Because only a small quantity of 30 ppm water is being added, a micro-emulsion forming concentrate can be used as an additive for use in already existing and commercially available liquid hydrocarbon fuels. This results in the following advantages. Even with a high ratio of surfactant to water is employed, the low water~~

~~requirement overall results in a low cost treatment relative to the fuel savings. With less surfactant being used per gallon of fuel relative to other treatments, there less emissions from incomplete combustion of surfactants. Even if over time the micro-emulsion breaks down, the amount of released water is not large and can be absorbed by the fuel. The expected improvement may be lost but no damage to the engine will occur which could lead to possible product liability claims. The smaller volumes involved with these additives are more readily acceptable to oil refineries and fuel distribution centers because the hardware already exists to incorporate other types of additives on this scale into the base fuels. If the whole fuel had to be emulsified and mixed after the refining process, the complexity and effort would dictate against employment~~.

Please replace the table beginning at page 9, line 6, immediately following paragraph [0033], with the following amended table:

Liquid	Preferred Ratio	Ratio Range
Surfactant(s)	3.0 to 1.0	8.0 to 0.5
Co-surfactant(s)	1.0 to 0.5	2.0 to ~~1.0~~ 0.0
Water	1.0	1.0

Please replace paragraph [0035] with the following amended paragraph:

[0035] Pre-diluting the concentrated additive ~~with kerosene (or some other solvent/distillate)~~ (to reduce its viscosity) with a hydrocarbon solvent (typically kerosene) at the ratio of from 50:1 up to 1:50 can be used to improve the additive/fuel mixing. Without adequate mixing, performance improvements may take as long as 24 hours for the concentrate to properly form into an effective emulsion after simply pouring the additive into a liquid hydrocarbon fuel.

Please exchange paragraph [0036] with the following replacement paragraph:

[0036] Treatment levels of concentrated micro-emulsion forming additive in the liquid hydrocarbon fuel should fall within the range from about 20 to 500ppm. With more than about 500ppm of additive, the process costs too much relative to the fuel savings. With less than about 20ppm of additive, there is generally too little surfactant present for the fuel emulsion to have any long term stability. This is because the background level of dissolved water (typically 75ppm) already present in most commercially available fuels will eventually produce an unstable fuel emulsion (insufficient surfactant to water ratio).

~~[0036] The ratio of liquid hydrocarbon fuel to concentrated micro-emulsion forming additive should fall within the range from 240:1 to 12,000:1. The treat rates are chosen so as to result in a micro-emulsified water content added to the hydrocarbon fuel in the range from 5-95 ppm, and typically 20-80 ppm~~.

Please replace the table beginning at page 31, line 12, immediately following paragraph [0209], with the following amended table:

TABLE 6 (Performance Analysis Tests #1 through #20)

				Emissions Reduction			
Test #	(%) Cost	(ppm) Water	(%) MPG	(%) HC	(%) CO	(%) NOX	(%) PM
1	55	50	10	20	–	–	–
2	17	50	6	–	–	5	15
3	51	50	10	60	–	–	–
4	95	50	–	–	–	3	6
5	99	50	4	6	–	–	–
6	25	50	10	50	–	–	–
7	89	50	2	90	–	–	–
8	52	50	5	45	–	–	–
9	88	50	2	–	–	6	23
10	42	50	10	40	–	–	–
11	56	50	6	–	–	5	18
12	100	50	10	50	–	–	–
13	11	32	–	13	10	36	–
14	7	20	10	80	–	–	–
15	2	5	~~22~~ 2.5	50	–	–	–
16	23	42	12	52	85	1	–
17	18	85	–	98	+35	95	–
18	9	22	14	49	–	9	22
19	11	0	–	–	–	5	15
20	7	95	10	90	–	–	–